CLAIMS

What is claimed is:

1. In the operation of a fuel cell system comprising (A) a fuel cell and (B) a source of organic fuel, (C) a source of air, and (D) a fuel processing system for converting an organic fuel into hydrogen, the fuel processing system comprising multiple catalytic fuel processing components, including a fuel reformer in series flow relationship with a catalytic shift converter, wherein, during fuel cell operation, a load is connected across the cell and organic fuel from the source is directed, in series, through the fuel reformer, the shift converter, and fuel cell anode flow field, a procedure for shutting down the fuel cell and fuel processing system comprising the steps of:
   a. disconnecting the load from the cell and halting the flow of organic fuel from the source to the fuel processing system; and, then
   b. purging the reformer of residual hydrogen by flowing air through the reformer.

2. The shut-down procedure according to claim 1, wherein, after step (a), the additional step (c) of purging the shift converter of residual hydrogen by flowing air through the shift converter.

3. The shut-down procedure according to claim 1, wherein the reformer and fuel cell are purged of residual hydrogen by passing air, in series, through the reformer and thereafter through the fuel cell anode flow field.

4. The shut-down procedure according to claim 1, wherein the air purge of the reformer in step (b) is continued at least until the concentration of hydrogen in the gas stream leaving the reformer is below 4%, by volume.

5. The shut-down procedure according to claim 1, wherein the shift converter and reformer are purged of residual hydrogen by passing air through the reformer and shift converter.

6. The shut-down procedure according to claim 5, wherein purging step (b) also includes passing a flow of steam through the reformer and then the shift converter.

7. The shut-down procedure according to claim 6, wherein in purging step (b) the steam and purge air are introduced into the reformer substantially simultaneously.

8. The shut-down procedure according to claim 6 wherein, in purging step (b), the steam flow through the reformer is done immediately prior to purging the reformer with air.

9. The shut-down procedure according to claim 1, wherein a selective oxidizer is disposed downstream of the shift converter, and step (b) also includes purging the shift converter and selective oxidizer of residual hydrogen by passing air, in series, through the reformer, shift converter, and selective oxidizer.

10. The shut-down procedure according to claim 1, wherein a desulfurizer is disposed upstream of the reformer, and step (b) also includes purging the desulfurizer of residual hydrogen by passing air, in series, through the desulfurizer, reformer, shift converter, and selective oxidizer.

11. The shut-down procedure according to claim 1, wherein the reformer and at least one other catalytic component of the fuel processing system is purged of residual hydrogen by flowing air through the reformer and such at least one other component, in series, wherein the volume of air used for such

purging step is at least three times the volume of the largest purged component.

12. The shut-down procedure according to claim 1, wherein the volume of air used to purge the reformer is at least three times the volume of the reformer.

13. The shut-down procedure according to claim 1, wherein in step (b) of purging the reformer using air, the purge air is introduced into the reformer through an inlet that is located at a low point of the reformer volume and passes through the reformer by natural circulation, exiting the reformer through an outlet that is located at a high point of the reformer volume.

14. The shut-down procedure according to claim 1, wherein the fuel processing system includes a reformer and at least one other catalytic fuel processing component arranged vertically in a stack, one above the other, and in series flow relationship, wherein, in step (b), the reformer and such at least one other components are purged of residual hydrogen by flowing air therethrough, in series, wherein the purge air is allowed into the stack through an inlet that is located at a low point of the vertically lowest of such catalytic component to be purged with air, and such air passes in series, by natural circulation, through each such fuel processing system component to be purged, exiting the highest of such catalytic components to be purged through an outlet that is located at a high point of such highest component.

15. The shut-down procedure according to claim 14, wherein the purge air flows through the stack in a direction opposite to the direction of flow that occurs during the processing of organic fuel to produce hydrogen.

16. The shut-down procedure according to claim 14, wherein the purging by natural circulation of air is allowed to continue until the hydrogen concentration in the purge gases exiting the stack of fuel processing components comprises less than 4% hydrogen.

17. The shut-down procedure according to claim 14, wherein, in step (b), the purge air is allowed into and out of the stack of fuel processing components through valves which are kept closed by energy produced by the fuel cell during normal fuel cell operation, and which are de-energized and automatically open when the load is disconnected from the cell stack in step (a).